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(54) **Diaper provided with an improved elastic fitting.**

(57) This diaper comprises at the level of each of its transverse edges, a strip (6)7) of open cell foam material extending transversely with respect to the diaper and fixed between the support and upper sheets of the latter. These elastic strips (6)7) are designed to come into elastic contact with the body of a user at the level of the latter's waist. The longitudinal inner and outer edges of each strip communicate respectively with the inner space of the napkin and with the outside of the latter to permit this inner space to communicate thus with the outer space through the thickness of the strips so as to permit the internal ventilation of the napkin.

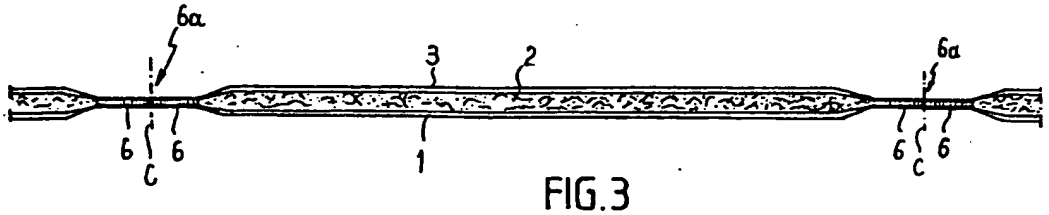

FIG.3

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DIAPER PROVIDED WITH AN IMPROVED ELASTIC FITTING

The present invention relates to diapers (or napkins), particularly discardable diapers, comprising a flexible and impermeable support sheet, a flexible and permeable upper sheet joined to the support sheet over at least a portion of the periphery of the diaper. A pad of absorbent material is placed between the upper sheet and the support sheet and elastic means positioned over at least a portion of the periphery of the diaper designed to be applied elastically onto the body of a user of this diaper.

Numerous diapers are now found provided with elastic members at the level of the crotch designed to form a barrier around the thighs of the user of the diaper. Such diapers have different shapes; thus, they may be rectangular with longitudinal edges, as the case may require, folded back to reduce the width at the crotch or have a cut-out at the level of this crotch in order to reduce the width of the diaper and thus to constitute a so-called anatomical shape.

These diapers provided with elastic elements at the crotch are generally well adapted to the body of the user and do not show leakages around the thighs at least when they are not saturated with liquid or poorly positioned.

However, leakages frequently occur around the waists of babies according to the position of the latter. Such leakages are associated with the morphology of the baby, who does not have a muscular abdominal belt. In spite of all the precautions which can be taken on the placing in position of the napkin, the latter, which is capable of being distorted at the level of the waist, begins, after a certain number of changes in position of the baby, to gape at the level of the waist of the latter which thus results in risk of leakages in the following cases:

-Direct leakages especially in reclining position. The flow rate of the urination, generally being very much greater at the level at which the urine flows through the permeable upper sheet, the urinary liquid escapes at the spot where the complete change is not tight. This type of leakage can also occur on occasional pressure exerted on the absorbent material of the pad when the latter is close to saturation;

-Direct leakages by directional orientation of the urination stream towards the place at the waist of the infant where the diaper has a tendency to gape, which is the case with boys;

-Leakage by capillary pumping when an undergarment of hydrophilic material slips between the skin and the diaper which gapes at the level of the waist.

To avoid such leakages and to apply the corresponding portion of the diaper better to the waist of

the user, certain diapers have been provided with elastic members in the form of strips, tapes or threads fixed to at least a part of the width of the diaper and at the border of the latter between the support sheet and the top sheet. Such diapers are described in patents FR-A-82 04 390 and 84 08 289.

However, these improvements associated with a more hermetic application of the diaper to the user do not make any contribution to provide means intended to place the inner space of the diaper in communication with the outside and in this manner to permit the passage of gaseous fluids and, thus, to ventilate the inside of the diaper to contribute to the comfort of the user.

In the prior art there are found diapers which, to arrange means of communication of their inner space with the outside when the diaper is worn, provide perforations or microperforations formed on the support sheet which normally is completely impermeable. It appears, however, that in the case of microperforations, the flow rate of gaseous fluid that the diaper can exchange with the outside is relatively low. In the case of perforations, the fluid tightness of the diaper with respect to liquid leakages is compromised, the permeability of the support sheet being too degraded.

It is an object of the invention to overcome the various aforesaid drawbacks by providing a diaper

which permits good elastic application around the waist of the user whilst providing effective means for placing the inner volume of the diaper in communication with the outside whilst preventing liquid leakages.

To this end, according to the invention, there is provided a diaper of the aforesaid type characterized in that the elastic means comprise at least one strip of elastic open foam material arranged between the support sheet and the top sheet so that the inner space of the diaper communicates with the outside of the latter through the thickness of each of the said strips.

According to other features of the invention:

-Each strip extends along its width over at least a portion of the interval comprised between an edge of the pad and the neighboring edge of the diaper and each strip is fixed on one surface to the support sheet and, on the opposite surface, to the top sheet to join these sheets together whilst leaving external and internal longitudinal edges of each of these strips to communicate respectively with the outside of the diaper and the internal space of the latter.

The outer edge of each strip and the neighboring edges of the support and top sheets are contained almost in the same plane, leaving the outer longitudinal edge of the strip visible.

The diaper comprises preferably two strips, each extending transversely over at least a portion of

the length of the diaper in the neighborhood of a corresponding transverse edge of the latter.

The diaper comprises two strips, each extending longitudinally over at least a portion of the length of the diaper in the vicinity of a corresponding longitudinal edge of the latter.

The foam material of each strip is water-repellent.

The foam material of each strip and the transverse section of the latter are such that the latter induces a considerable pressure drop in the flow of the liquid through the strip whilst being permeable to gaseous fluids.

-The transverse section of each strip is such that, in order to have a sufficient tractive or compressive force exerted on each strip, the open cells are closed by traction or compression in order to avoid any flow of fluid.

The invention will be better understood on reading the description which follows of an embodiment given purely by way of example and with reference to the drawings, in which:

Fig. 1 is a plan view of the inner surface of the diaper according to the invention;

Fig. 2 is a view in section along the line 2-2 of Fig. 1; and,

Fig. 3 is a view in longitudinal section of a napkin in which are formed several diapers which extend longitudinally whilst being each joined through their transverse edges to the corresponding neighboring diapers.

The diaper illustrated in the figures is intended to be thrown away after use and has a profiled shape by arranging a portion of reduced width for positioning at the level of the crotch of the user. This diaper comprises principally a flexible and impermeable support sheet 1, for example, of polyethylene, a pad 2 of absorbent material, for example, of defibered wood pulp, of cellulose wadding or any other absorbent material, such as so-called super-absorbent polymers, and a flexible and permeable top sheet, in particular permeable to urine, formed of, for example, a non-woven cloth or of perforated plastic film.

The absorbent pad 2 is placed between the support sheet 1 and top sheet 3, the latter being joined together over the whole of their periphery, for example, by gluing or heat-sealing, to thus enclose the pad within an internal space of the diaper bounded between the sheets.

In addition, to ensure the positioning of the diaper on the user, a fastening system is provided at one end of each longitudinal edge of the latter in the form of an adhesive tongue 5, each designed to cooperate with

the support sheet 1 on a corresponding side of the opposite end of the diaper on its placing in position on the user.

The diaper comprises in addition a first elastic system formed by two elastic strips 6, each arranged along an intermediate portion of a corresponding transverse edge of the diaper and a second elastic system formed from two elastic strips 7, each extending longitudinally along a corresponding longitudinal edge of the diaper at the level of the crotch.

The strips 6, 7 of the first and second elastic systems are each fixed and tensioned between the support sheet 1 and the top sheet 3, thus forming gathered sections visible in Fig. 1.

These strips 6, 7 extend along the width over the whole of the interval comprised between the neighboring edge of the absorbent pad 2 and the corresponding edge of the diaper itself. Thus, at the level of the peripheral portions of the diaper where these strips 7 extend, the upper and support sheets are joined together through strips which are each fixed, for example, by gluing or by thermo-welding, on one of their surfaces to the support sheet 1 and, on their opposite surface, to the top sheet 3. This gluing of the strips to the sheets must be limited to the surfaces of these strips without extending into the thickness of the latter in order to avoid plugging the cells of the foam which must remain open.

The adhesion of the support sheet 1 and top sheet 3 to each strip 6 or 7 must, preferably, be such that no flow path can exist for a fluid between each of these sheets and the corresponding surface of the strips so as to avoid liquid leakages.

It will be noted, in addition, in Figs. 2 and 3, that the outer longitudinal edge of each strip 6 or 7 and the neighboring edges of the top sheet 3 and support sheet 1 are contained within almost the same plane to leave thus visible the outer longitudinal edge of the strip, the inner longitudinal edge of the latter communicating between the sheets with the inner space of the diaper wherein the pad 2 extends. This arrangement is, in fact, obtained by cutting simultaneously the two sheets and the strips at the time of fabrication of the diaper. It is seen by referring to Fig. 3 that each strip 6 comes from a corresponding strip 6a cut out longitudinally approximately at its middle to form two strips 6, each belonging to two distinct diapers.

In Fig. 3, the diapers not yet detached from one another are assembled in one layer where they follow one another by being joined at their transverse edges, a strip 6a extending transversely between each of these unseparated diapers by being fixed between the support sheet 1 and top sheet 3 still in the form of continuous films. From this layered structure, the diapers are then detached successively from one another by transverse

cutting off along the lines C (Fig. 3) approximately at the middle of each strip 6a which has therefore a width substantially double that of each strip 6. The outer and inner longitudinal edges of the strip 6 or 7 communicate respectively with the outside of the diaper and the inner space of the latter as will be demonstrated below in the rest of the description.

In accordance with the invention, each strip 6, 7 is formed of an open cell foam elastic material, for example, of polyester, of polyether (polyurethane) or any other suitable material.

By way of example, it is possible to use polyurethane foam of density equal to about 34 kg/m^3.

The role of these strips is not only to confer on the places of the diaper where they are placed, a certain elasticity intended to apply elastically and as hermetically as possible, the diaper to the corresponding parts of the body of the user, but also to permit the placing in communication of the inner space of the diaper with the outside of the latter when the diaper is worn by the user, this communication taking place through the thickness of each strip through their open cells which permits advantageous ventilation of this inner space.

The thickness of the strips 6, 7 may be comprised between about 1 and 5mm, preferably between about 2 and 3mm, the thickness of the strips 6 extending transversely, and preferably less than about 50mm, the width

of the strips 7 extending longitudinally being less than about 35mm and, preferably, equal to about 25mm.

The elasticity of the foam strips 6 must be sufficient to cover the maximum variations in waist size of the user (10cm for an infant of about 10 to 12kg). In addition, the thickness of the strips 6 or 7 must be sufficient to ensure good strength but must not be too great so as to limit the force necessary for elongation of each of the strips in order to preserve thus the comfort of the user and to permit the closing of the open cells by longitudinal stretching or compression in the thickness on tension of the strip or compression of the latter in order to avoid forced leakages of liquid through the foam.

The porosity of the foam material and the transverse section of the strips are such that the latter induce a high pressure drop with respect to the flow of the liquid through each strip which remains permeable to gaseous fluids. This selective character of the permeability with regard to gases rather than with regard to liquids is, in addition, increased by the hydrophobic nature of the foam material which thus counters the flow of aqueous liquids upon urination.

Each strip thus ensures the fluid tightness of the application of the diaper to the body of the user whilst simultaneously permitting ventilation of the inner space of this diaper.

In use, this diaper is placed on the user so that the strips 7 situated at the level of the crotch grip the thighs of this user and so that the strips 6 are applied to the waist of the latter.

The longitudinal elasticity of the foam strips permits the waist of the infant to be gripped by soft contact of the diaper around it in any position, eliminating direct leakages, a comfortable grip being also reproduced around the thighs. The elastic foam through its composition permits a notable elongation even for a width and thickness of the strip which are fairly large under the action of a weaker force with respect to other conventionally used elastic materials.

The thickness of the foam permits, moreover, a second elastic effect to be contributed by compression of the cells open in the direction of the thickness. This property improves the comfort of the user whilst eliminating the risk of leakages by pressure on the absorbent material, the cross-section of each strip being in fact such that, under the effect of a sufficient force of compression or of traction, the open cells are closed by compression or stretching of the strip respectively.

The elastic properties in extension and in compression of the strips thus permit an anti-leakage barrier to be obtained which is as effective as that which it could be hoped to obtain by means of a compact

elastic material whilst showing better flexibility of application to the body of the user, which procures for the latter an important sensation of comfort.

According to yet another advantage, the use of open cell foam for the elastic strips enables the ventilation of the inner space of the diaper whilst resisting passages of fluids.

Although the example of a diaper previously described to illustrate the invention comprises an elastic system intended to grip the waist of the user and an elastic system intended to grip the thighs of the latter, it is clear that one or other of these elastic systems may be used independently of the other.

However, the preferred embodiment of the invention recommends placing the open cell foam strips previously described at the level of the transverse edges of the diaper to the extent that it is this spot, intended to be applied to the waist of the user, that the foam strips will play most effectively their role of means of communication of the inner space of the diaper with the outside. In fact, the open cells of the foam strips provided on the longitudinal edges of the diaper have, when the latter is worn by a user, a tendency to be held closed when the crotch of the diaper is applied hermetically around the thighs and the corresponding strips are then stretched. The thighs are only subjected to a slight variation in circumference as a function of the different positions of the user, the state of initial

tension of the foam strips provided the level of the crotch is hence always more or less substantially preserved and, for this reason, the cells have less tendency to be kept open.

On the other hand, when these foam strips are placed on the transverse edges of the diaper, they become applied to the waist of the user and it is well known that, at the level of the abdomen, the body varies notably in circumference as a function of the respiratory movements or abdominal muscular contractions. These variations in circumference permit, even if the diaper has been applied in a stretched manner around the waist, the corresponding foam strips to be substantially relaxed and thus permit at least periodically the opening of the cells if the latter are otherwise closed and favor the ventilation of the inner space of the diaper.

The diaper may be of any conventionally known general shape, other than those previously described, for example, rectangular, in the form of an H or with any other anatomical cutout. According to another modification, a space may be formed between one elastic strip and the neighboring edge of the absorbent pad if the inner longitudinal edge of the strip can communicate with the inner space of the diaper. According to another modification, the outer edge of one elastic foam strip may be stretched more at the inside or more at the outside of the neighboring edges of the top and support

sheets with respect to the diaper, the essential thing being that the outer longitudinal edge of this strip should communicate with the outside of the diaper.

It is well understood that the invention is not limited to use for babies, but can also be used by a user of any age, for example, an incontinent adult, the dimensions of the diaper being then adapted to the corpulence of the user.

CLAIMS

1. Diaper comprising a flexible (1) and impermeable support sheet, a flexible and permeable top (3) sheet joined to the support sheet over at least a portion of the periphery of the diaper, a pad of absorbent material arranged between the top sheet and the support sheet and elastic means (6, 7), positioned over at least a portion of the periphery of the diaper, designed to be applied elastically to the body of a user of this diaper, wherein the elastic means comprise at least one strip (6, 7) of an elastic material of open cell foam, arranged between the support sheet and the top sheet so that the inner space of the diaper communicates with the outside of the latter through the thickness of each of said strips.

2. Diaper according to claim 1, wherein each strip (6, 7) extends along its width over at least a portion of the interval comprised between one edge of the pad (2) and the neighbouring edge of the diaper and wherein each strip is fixed on one surface to the support sheet (1) and on the opposite surface, to the top sheet (3) to connect these sheets together allowing the outer and inner longitudinal edges of each of these strips, to communicate respectively with the outside of the diaper and the inner space of the latter.

3. Diaper according to claim 1 or 2, wherein the outer edge of each strip and the neighbouring edges of the support and top sheets, are contained approximately in the same plane, leaving visible the outer longitudinal edge of the strip.

4. Diaper according to claim 3, wherein each strip extends along its width over the whole the interval comprised between the neighbouring edge of the pad and the corresponding edge of the diaper.

5. Diaper according to any one of the preceding claims, wherein the foam material of each strip is water-repellent.

6. Diaper according to any one of the preceding claims, wherein the foam material of each strip and the cross-section of the latter, are such that the strip imposes a pressure drop on the flow of a liquid through the strip whilst being permeable to gaseous fluids.

7. Diaper according to any one of the preceding claims, wherein the cross-section of each strip is such that for a sufficient traction or compression force exerted on the strip, the open cells close so as to avoid any flow of fluid.

8. Diaper according to any one of the preceding claims, wherein it comprises two strips (6) each extending transversely over at least a portion of the width of the diaper in the vicinity of a corresponding transverse edge of the latter.

9. Diaper according to any one of the preceding claims, comprising two strips each extending longitudinally over at least a portion of the length of the diaper in the vicinity of a corresponding longitudinal edge of the latter.

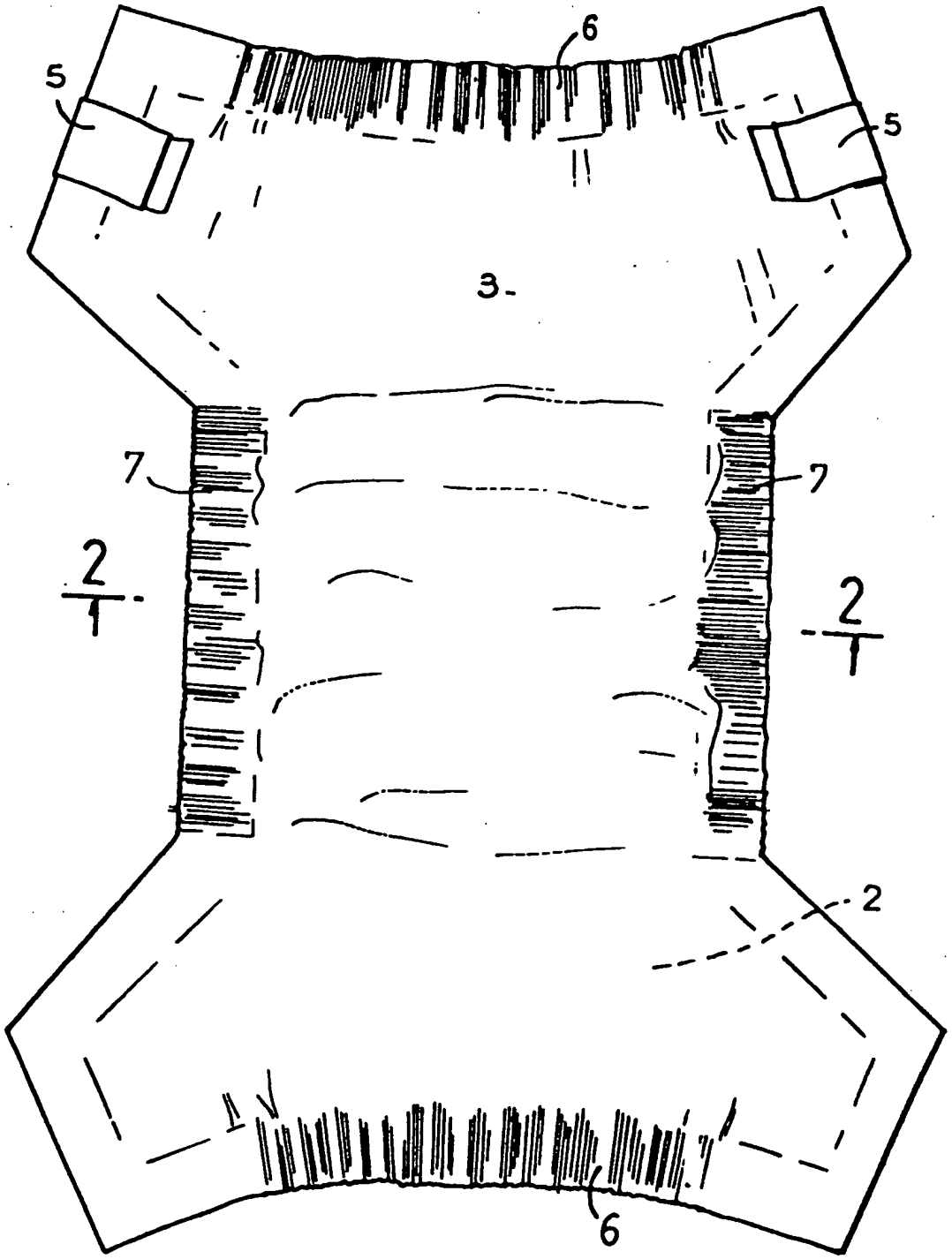

FIG.1

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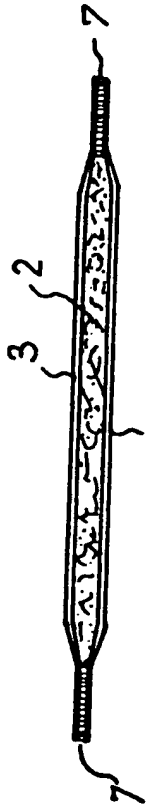

FIG.2

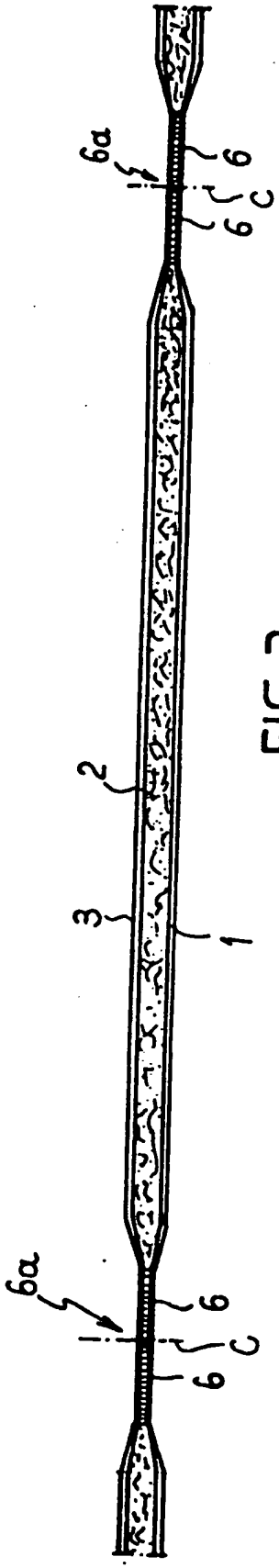

FIG.3

European Patent Office

EUROPEAN SEARCH REPORT

0219969
Application number

EP 86 30 6995

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)
X	GB-A-2 085 281 (UNI-CHARM CORP.) * Page 3, lines 96-130; page 4, lines 1-49; claims 5-7; figures 1-3,12,13 * ---	1,6,9	A 41 B 13/02
Y	GB-A-2 130 888 (THE PROCTER & GAMBLE CO.) * Page 2, lines 75-110,117-128; page 3, lines 1-11; page 4, lines 68-130; page 5, lines 1-11,96-130; page 6, lines 1-36; figures * ---	1	
A		2,3,4,8	
Y	FR-A-2 388 515 (THE PROCTER & GAMBLE CO.) * Page 8, lines 2-20; claims 1,8; figures * ---	1	TECHNICAL FIELDS SEARCHED (Int Cl 4) A 41 B
A		5	
A	FR-A-2 289 131 (COLGATE-PALMOLIVE CO.) ---		
A	FR-A-2 421 571 (JOHNSON & JOHNSON) --- -/-		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23-12-1986	GARNIER F.M.A.C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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